

PhoneSat in-flight Experience Results

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Abstract:

Consumer technology, over the last decade, has begun to encompass devices that enable us to figure out where we are, which way we are pointing, observe the world around us, and store and transmit this information to wherever we want. Once separate consumer products such as GPS units, digital cameras and mobile phones are now combined into the modern day Smartphone. Since these capabilities are remarkably similar to those required for the multi-million dollar satellites - so why not use a multi-hundred dollar Smartphone instead? The PhoneSat project of NASA Ames Research Center is developing technology demonstrations utilizing these extraordinary advances to show just how simple and cheap Space can be. The style of development revolves around the "release early, release often" Silicon Valley mentality.

PhoneSat is a series of 1U CubeSat size spacecrafts that use an off-the-shelf Smartphone as their on-board computer. By doing so, PhoneSat takes advantage of the high computational capability, large memory as well as ultra-tiny sensors like high-resolution cameras and navigation devices that Smartphones offer. Along with a Smartphone, PhoneSat is equipped with other commercially available technology products, such as medical brushless motors that are used as reaction wheels.

Over the four years that NASA Ames Research Center has been developing the PhoneSat project, different suborbital and orbital flight activities have proven the validity of this revolutionary approach. In early 2013, the PhoneSat project launched the first triage of PhoneSats into LEO. In the five day orbital life time, the nano-satellites flew the first functioning Smartphone based satellites (using the Nexus One and Nexus S phones), the cheapest satellite (a total parts cost below \$3,500) and one of the fastest on-board processors (CPU speed of 1GHz). In late 2013, the PhoneSat project launched an improved version of its bus to a higher altitude orbit which provided data about the overall system's tolerance to the space environment. In this paper, an overview of the PhoneSat project as well as a summary of the in-flight experimental results is presented.

NASA Ames Research Center is carrying on its effort to bring a paradigm shift in the way we conceive Space exploration, this new approach is certainly incarnated by PhoneSat. A set of eight PhoneSat-based CubeSats is manifested to launch in 2014 with the purpose of demonstrating new technical capabilities and being a pathfinder for future Spacecraft technology missions.